GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF RESEARCH ADMINISTRATION

RESEARCH PROJECT INITIATION

Date: June 12, 1975

Project Title: Instructional Scientific Equipment

Project No: E-25-522 (2 of 5 training grant)

Principal Investigator: Dr. Wayne J. Book

Sponsor: National Science Foundation

Agreement Period: From June 1, 1975 Until May 31, 1977

Type Agreement: Grant No. MPS 75-12422

Amount: $19,700 NSF
$19,700 GIT (E-25-213)
$39,400 Total

Reports Required: Final Report

Sponsor Contact Person (s):

Instructional Scientific Equipment Program
National Science Foundation
Washington, D. C. 20550

Assigned to: Mechanical Engineering

COPIES TO:
- Principal Investigator
- School Director
- Dean of the College
- Director Research Administration
- Director Financial Affairs (2)
- Security Reports-Property Office
- Patent Coordinator
- Library
- Rich Electronic Computer Center
- Photographic Laboratory
- Project File
- Other

RA-3 (6-71)

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

2395

SPONSORED PROJECT TERMINATION

No action 60 days 6M

Date: November 23, 1977

Project Title: *Instructional Scientific Equipment*

Project No: *E-25-522*

Project Director: *Dr. Wayne J. Book*

Sponsor: *National Science Foundation*

Effective Termination Date: *5/31/77*

Clearance of Accounting Charges: *5/31/77*

Grant/Contract Closeout Actions Remaining:

_ Final Invoice and Closing Documents
X Final Fiscal Report -- *NSF 363*
_ Final Report of Inventions
_ Govt. Property Inventory & Related Certificate
_ Classified Material Certificate
_ Other _____

Assigned to: *Mechanical Engineering* (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director—EES
Accounting Office
Procurement Office
Security Coordinator (OCA)
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Library, Technical Reports Section
Office of Computing Services
Director, Physical Plant
EES Information Office
Project File (OCA)
Project Code (GTRI)
Other _____

CA—4 (3/76)

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332

SCHOOL OF
MECHANICAL ENGINEERING

September 30, 1977

Instructional Scientific Equipment Program
Division of Higher Education in Science
National Science Foundation
Washington D.C. 20550

Dear Sir/Madame:

Attached is a table of equipment purchased under ISEP grant number HES75-12422. Several substitutions were made for proposed equipment which better achieved the purposes of our educational program, and which reflect price changes and technological developments.

Item A3, A4 and A5 in the proposal were originally prepackaged experimental laboratories. As stated in the proposal, the laboratory is intended to relate control theory to practical physical systems. On close examination of the prepackaged laboratories it was found that they did not accurately represent practical systems and that the desired results could be achieved with less expense by purchasing components separately. These components are listed opposite the proposed purchases

The other notable modification was made in the proposed item G1, Analog computers. Subsequent to the submission of the proposal the School of Mechanical Engineering purchased a number of analog computers for student use. Furthermore, the advancing technology of microprocessors has become very important in control. Money saved on items A3, A4 and A5, together with that allocated for analog computers and accessories was used to purchase a microcomputer for use in digital control.

Additional savings were used to purchase general purpose signal conditioning equipment not originally proposed.

Implementation of the laboratory was begun approximately a year after the award of the grant when matching funds become available. Since that time the equipment has been used in classroom demonstrations for about 130 students. The reaction to these demonstrations has been overwhelmingly favorable and increased use in planned. A laboratory course is now being offered for the second time as a "Special Topic" to develop laboratory exercises and notes for a regular undergraduate course. Four students with a special interest in controls have done "Special Problems" for academic credit using this equipment. These special problems have helped to develop the laboratory experiments and at the same time give the students a unique design experience. Additional students have worked with this equipment in the

required senior projects course on "Experimental Engineering".

I encourage the Foundation to continue this program as it is a valuable resource for science education. A suggestion for consideration is a grant for faculty release time for course or laboratory development to be awarded in conjunction with the grant for the equipment. Finally, I consider the project to be a success and would like to express my appreciation to NSF.

Sincerely

Wayne Book
Project Director

WJB:maw

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SUMMARY OF COMPLETED PROJECT

Form Approved
OMB No. 99R0013

Please read instructions on reverse carefully before completing this form.

1. INSTITUTION AND ADDRESS	2. NSF PROGRAM	3. GRANT PERIOD
Georgia Institute of Technology School of Mechanical Engineering Atlanta, GA 30302	Instructional Scientific Equipment Program	6/1/75 - 5/31/77 *from* *to*

4. GRANT NUMBER	5. BUDGET DUR. (MOS)	6. PRINCIPAL INVESTIGATOR(S)	7. GRANTEE ACCOUNT NUMBER
HES75-12422	24	Dr. Wayne J. Book	

8. SUMMARY (Attach list of publications to form)

The application of the theory of automatic controls by students is greatly facilitated by demonstrations and laboratory experiences. As the theory is applicable to a variety of physical systems including thermal, electrical, mechanical and fluid processes, the laboratory should be capable of demonstration those applications. The mechanical engineering student has a background which qualifies him to examine these systems and that background should be extended to include the automatic control of these systems.

The grant funds were used to purchase hardware for instrumentation, control, and construction of five systems. These systems have been used to demonstrate control principles to over 130 students in the past year. The result has been a better understanding of the practical applications of a subject previously considered too abstract by the students.

9. SIGNATURE OF PRINCIPAL INVESTIGATOR/ PROJECT DIRECTOR	TYPED OR PRINTED NAME	DATE
	Wayne J. Book	9/30/77

INSTRUCTIONS FOR SUMMARY OF COMPLETED PROJECT
(NSF Form 98A)

GENERAL

Grantees are reminded that the requirement for the submission of this Summary to the National Science Foundation does not change the present requirement for reprints of publications to be forwarded to the Foundation program unit having cognizance over the grant. In addition to the Summary of Completed Project (NSF Form 98A), for reports to be deposited in the National Technical Information Service, Bibliographic Data Sheet (NTIS Form 35) should be used.

SUMMARY

The summary (approximately 300 words) must be self-contained so as to be intelligible to a knowledgeable reader. Without restating the project title, it should begin with a topic sentence stating the project's major thesis. In preparing the summary the author should include, if pertinent to the project being described, the following items:

—The primary objectives and scope of the project.

—The techniques or approaches used only to the degree necessary for comprehension.

—The findings and implications stated as concisely and informatively as possible.

Grantees should bear in mind that this Summary of Completed Projects may be used together with the project summary prepared by the Foundation at the time of the award to answer inquiries by nonscientists as to the nature and significance of the research which the Foundation supports. Scientific jargon and abbreviations should be avoided when possible.

The requirements outlined in the American National Standard for Writing Abstracts (ANSI Z39.14-1971) may be useful in preparing the summary.

PUBLICATIONS

A list of publications based all or in part on the information/findings generated by this NSF-supported project should be attached to this form when it is submitted to NSF.

SUBMIT TWO COPIES OF THIS REPORT TO:

NATIONAL SCIENCE FOUNDATION
DIVISION OF GRANTS AND CONTRACTS
1800 G ST., N.W.
WASHINGTON, D.C. 20550

INSTRUCTIONAL SCIENTIFIC EQUIPMENT PROGRAM

SUMMARY REPORT FORM

Proposal number E25-522

Grant number HES75-12422

Date: October 4, 1974

Discipline Engineering Mechanical

Broad - Detailed

TO: Division of Higher Education in Science
National Science Foundation

FROM: Dr. Wayne J. Book
Project Director

Georgia Institute of Technology Atlanta Georgia

Equipment Substitutions and Additions

	Requested Equipment as Listed in Original Proposal		Cost and Description of Actual Purchases	
Proposal Item No.	Estimated Cost	Description	Actual Cost	Description
A1	$2,440	Chart recorders (2 @$1220)	$3,278	Two pen chart recorders Leeds and Northrup (2 ea. @$1561.55)
A2	2,990	X-Y recorder (2 @$1495)	2,821	X-y recorder. Hewlett Packard 7035 B and Time base 17108AM ($1,504) X-Y recorder, Hewlett Packard 7035 B ($1,317)
A3	2,390	DC Electric Servo Lab (2 @$1195)	1,627	D-C Permanent Magnet Motor with Tachometer and Gearhead (2 @$159) Bipolar Operational power supply Kepco BOP 36-1.5M (2 @$649)

Equipment as Listed in Proposal			Actual Purchases	
Proposal Item No.	Estimated Cost	Description	Actual Cost	Description
A4	$10,850	Electrohydraulic Servo Lab	$2,914	Electrohydraulic Valve. Dynamic Valves Inc. and Manifold ($655) Piston Servo Motor Sperry Vickers ($279) Piston Pump, Fixed Displacement Sperry Vickers ($263) Hydraulic reservoir with Heat exchanger circuit (Various components) ($260) Power Supply and Amplifier Hewlett Packard ($352) Hydraulic Cylinder WABCO Fluid Power Division of American Standard ($221) Linear velocity transducers Linear variable differential transformers and accessories ($513) Signal conditioning for LVDT Schacvitz Engineering LPM-205 ($169) Laboratory D.C. Power Supply Power Mate BPA-40D ($202)
A5	3,250	Pneumatic Servo Lab	852	Flow meter. Brooks Instrument Size 8 ($181) Linear variable differential Transformer Schaevitz Engr. 3000HR. Linear velocity transducer Schaevitz Engr. 7L6VT-Z and accessories ($340) Signal conditioning for LVDT Schaevitz Engr. LPM-205 ($169) Laboratory d.c. power supply Power Mate BPA-20C ($162)

Equipment as Listed in Proposal			Actual Purchases	
Proposal Item No.	Estimated Cost	Description	Actual Cost	Description
A6	$2,158	Analog to digital and digital to analog converters	$1,551	Vector Electronics cage, P.C. Boards and Modules, (8 ea) Accopian power supplies Datel Analog to digital converters (5 ea), Datel digital to analog converters (2 ea) and Bud Cabinet Rack.
A7	1,122	Universal Load Transducing Cell and accessories (2 ea) Statham	1,905	Universal Transducing Cell UC-2 with Load Cell, Pressure cell diaphrams (2 ea) dispacement accessory and Bridge Amplifier. (2 ea.) Statham.
A8	1,350	Thermocouple current converter	621	Thermocouple jack panel, connectors thermocouple switch, amplifier with ice point reference, Omega Engineering.
A9	650	Thermocouple 24 v power supply		
A10	435	Differential Pressure Transducer	278	Dry Manometer with piping and Valves Meriam Instrument
A11	540	Function Generator	1,110	Function Generator Tektronics FG-501 and Mainframe TM-501 (2 ea)
A12	493	Multifunction Voltmeter	1,209	Multifunction Voltmeter with leads. Temperature Probe and main frame Tektronix DM-501, P6058, and TM-501 ($696) Multifunction voltmeter with test leads. Hewlett Packard 3465A ($513)
A13	2,360	Oscilloscope and plugin modules	6,158	Storage oscilloscope with differential amplifier, time base probes and two instrument carts. Tektronics 5103 N/D11, 5A22N, 5B10N et.al. ($2,781)

Equipment as Listed in Proposal			Actual Purchases	
Proposal Item No.	Estimated Cost	Description	Actual Cost	Description
				Storage Oscilloscope with differential amplifier, dual trace amplifier, time base, probes, and camera Tektronix 5103N/D13, 5A22N, 5A18N, P6006, and C5. ($3,377)
C1	$ 198	Analog Computer Trainer Cassette and Player	$ 150	Self Study Course for Microprocessors. Texas Instruments
D1	585	Current to Air Transducer (3 @ 195)	712	Electropneumatic Transducer Masoneilan #8005, 3 ea.
D2	350	Pneumatic 3 way valve (2 @ 175)	558	Pneumatic 3 way valve Masoneilan #37-80385 and air set
D3	350	Pneumatic control valve (2 @ 175)	824	Pneumatic Control Valve Masoneilan #29211 and air set ($412) Pneumatic Control Valve Masoneilan #29231 and air set ($412)
D4	150	Electric on-off Control Valve		
D5	660	Polyethylene tank (6 @ 110)	117	Heat Exchanger. American Standard BCF 03008
D6	1,000	Shop time (200 hrs @ $5)		
D7	1,000	Material	1,132	Seal pots, Orifice plate and flange, 3 flowmeters, ball valves, thermocouple and extension wire.
G1	3,130	Analog Computers (2 @ 1565)	7,391	Microproccessor development system. Texas Instruments 990/4 with TTL I/O Module and connectors
G2	410	Diode Function Generator (2 @ 205)		

Equipment as Listed in Proposal			Actual Purchases	
Proposal Item No.	Estimated Cost	Description	Actual Cost	Description
G3	$ 410	Bannana Plug Modules		
G4	195	Three Mode Controllor	$ 886	Electronic controller with three mode (P.I.D.) action. Leeds and Northrup Electromax III, 2 ea.
			3,000	Differential Amplifier Honeywell Accudata 122-3 (4 @ 750)
			295	Gage control unit with power supply. Honeywell Accudata 105-2
			540	Gage control unit. Honeywell Accudata 105-1 (3 @ 180)
			159	Eight channel rack adapter